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THE GENUS *TETRABRACHYS* (*LITHOPHILUS*) WITH NOTES ON ITS BIOLOGY AND A KEY TO THE SPECIES (COLEOPTERA, COCCINELLIDAE).

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(*Commonwealth Institute of Entomology.*)

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With Thirty-eight Text-figures and One Map.

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1. Introduction.

A new name, *Tetrabrachys*, is proposed for the genus *Lithophilus* Frölich (1799) which is preoccupied in Carabidae (Coleoptera), *vide* Schneider (1791). The genus is of special interest in that it differs from all other Coccinellidae in having four clearly defined tarsal segments instead of the apparently 3-segmented tarsi present in the rest of the family. It has, therefore, been considered primitive and placed in a separate subfamily. In the other known structural details, such as the securiform palpi, irregularly triangular mesepimera, small antennae and the structure of the genitalia, it resembles the rest of the Coccinellidae. Its mandibles are of the carnivorous type, but so far nothing is known of its food. The geographical distribution and habitat are also interesting, but little is known of the biology as the species are not common. Structurally the species do not differ greatly from one another—a fact which, in the absence of long series of most of them, renders their identification very difficult. However, long series of a few species are available, and these clearly indicate that with the exception of their colour, the relatively small differences which are apparent are fairly constant and are therefore reliable. As far as one can judge from the material available, this is true of the male genitalia and

also of the shape of the spermathecal capsule in the female. Another important specific character, which seems to have been overlooked in this genus, is the shape of the femoral lines. As Peyerimoff (1943 : 11) has pointed out, a revision of the genus is badly needed, but much more collecting will have to be done before it can be satisfactorily completed. The present paper, based mainly on the material in the collection of the British Museum, is, therefore, a preliminary study, made with the object of stimulating further interest in the subject.

The illustrations were made mostly with the help of *camera lucida* by the author except for fig. 1, which was made by Mr. Arthur Smith.

2. Nomenclature.

For a defined generic concept based on a number of species of Carabidae, Schneider (1791) suggested that either the name *Epactius* or *Lithophilus* should be adopted. As both these names referred to the same concept they are synonymous and are, therefore, not available for use elsewhere according to Article 36 of the International Rules of Zoological Nomenclature, which reads as follows : " Rejected homonyms can never be used again. Rejected synonyms can be used again in case of restoration of erroneously suppressed groups." Consequently *Lithophilus* Frölich (1799) could not be employed in the Coccinellidae, and the new name, *Tetrabrachys*, is proposed instead. According to Article 5 of the Rules " the name of the family or subfamily is to be changed when the name of its type genus is changed " ; since *Lithophilus* Frölich alone constituted the subfamily Lithophilinae Ganglbauer (1899), it becomes necessary to change the subfamily name to Tetrabrachinae.

3. Description of the Genus *Tetrabrachys*.

Body (figs. 1–2) more or less elongate oval, from moderately convex to subdepressed, usually of sombre colour, pubescent on the upper and underside and devoid of the membranous wings. Head subrounded, very slightly convex dorsally and partly retracted below the pronotum ; eyes large, coarsely facetted and pubescent with short delicate hairs ; clypeus extended laterally at the base into the eyes in the form of a short wedge, its sides short, slightly convergent towards the broadly truncate anterior margin and not covering the base of the antenna ; antenna (fig. 11) ten-segmented, clubbed, obconical, compact and provided with sensory hairs on all the segments ; labrum (fig. 12) transverse, subquadrangular ; mandibles (fig. 13), each with a bifid apex and a pointed basal tooth ; maxillary palpus (fig. 14) conspicuous, four-segmented, first segment short and subrounded, second oblong and clavate, third short, fourth compressed, largest, triangular and strongly securiform ; labium (fig. 15) broadly tubular and truncate anteriorly, labial palpi short and pointed. Pronotum (figs. 1–8) transverse, moderately convex and in outline varying from cordiform to subrectangular. Scutellum very small, triangular. Elytra usually oval, fitting closely together at the suture, moderately convex. The anterior coxal cavities widely open posteriorly, mesosternum well developed, subtriangular and concave in the middle. Elytral epipleurae (fig. 9) broadest behind the shoulders and gradually narrowing posteriorly to terminate usually before the third abdominal sternite ; meso and metasterna correspondingly narrower where the epipleurae are wider. Legs (fig. 16) short, tibiae elongate, femora narrow, subcompressed, tarsi clearly four-segmented, subtubular, the first and the last segments longer than the middle two, claws slender, each with a minute dentation in the middle. The visible abdominal sternites (fig. 21) five, first nearly twice as long as any of the subsequent four, which are subequal ; femoral lines (fig. 21–24) usually complete, conical or angular, sometimes discontinuous in the middle (fig. 22). Male genitalia (known for some species only) : sipho (fig. 28*a*) straight distally and curved proximally, with a transverse siphonal capsule (figs. 33–37) ; penis (figs. 28–30) pouch-shaped, usually triangular or conical in outline and much shorter than the filiform to spatulate paramera. In female the last abdominal segments form a tubular structure (figs. 25, 26), which is retracted inside the body ; spermathecal capsule (figs. 17–20) strongly chitinized and usually semicircular in shape.

4. Geographical Distribution.

There are about fifty species in the genus distributed as shown in the accompanying map and the following list of the countries with the recorded species in each case. Additional records based on the collection in the British Museum (indicated as B.M.) and the species described at the end of this paper are also included.

Countries.	*Tetrabrachys* Species.
EUROPE :	
Portugal and Spain	*cordatus* (Rosenhauer, 1856); *deserticola* (Wollaston, 1864). *atlanticus* (Escalera, 1914).
France, Germany, Austria and Hungary	*connatus* (Panzer, 1796).
Greece	*connatus* (Panzer) (B.M.); *graecus* (Reitter, 1879); *kalawrytus* (Reitter, 1883); *subseriatus* (Reitter) (B.M.).
Crete and Rhodes Island	*creticus* (Reitter, 1889); *silvestri* (Schatzmayr, 1939).
ASIA :	
Turkey, Asia Minor (including European Turkey)	*anatolicus* (Pic, 1901); *gibbosus* (Sahlberg, 1913); *graecus*; *insculptus* (Sahlberg, 1913); *major* Crotch, 1874); *osculati* (Marietti, 1844).
Crimea	*tauricus* (Semenow, 1902).
Armenia	*araxis* ab. *triplagiatus* (Reitter, 1897).
Caucasus	*araxis* (Reitter, 1897); *caucasicus* (Weise, 1878); *weisei* (Reitter, 1897).

Countries.	*Tetrabrachys* Species.
ASIA:	
Turkestan	*bipustulatus* (Barovsky, 1909); *cryptophagoides* sp. n.; *glazunovi* (Barovsky, 1909); *haemorrhous* (Solskii, 1882) *hissariensis* (Barovsky, 1910); *jacobsoni* (Barovsky, 1909); *krasnowi* (Semenov, 1891); *nigripennis* (Reitter, 1891); *semenovi* (Barovsky, 1909): *sumakovi* (Barovsky, 1909).
Southern Siberia	*kozlovi* (Barovsky, 1909); *roddi* (Barovsky, 1909).
Mongolia and North China	?*subseriatus* (Reitter, 1883); ? *subseriatus* var. *unicolor* (Reitter, 1883); *villosa* (Faldermann, 1835).
North India	*robusta* sp. n.; *gandhara* sp. n.
Persia	*minimus* (Barovsky, 1910); *pallidus* (Crotch, 1874); *zarudnyi* (Barovsky, 1909).
Syria	*cruciatus* (Sahlberg, 1913); *graecus*; *marginatus* (Reitter, 1884); *trimaculatus* (Reitter, 1883).
Palestine and Sinai	*cordicollis* (Guerin) (B.M.); *grandis* (Pic, 1901); *latus* (Reitter, 1883); *marginatus*; *ovipennis* (Crotch, 1874); *peyerimhoffi* (Pic, 1903).
Arabia	*arabicus* sp. n.; *minutus* (Pic) (B.M.); *tenebrosus* (Weise) (B.M.); *yemenensis* sp. n.
AFRICA:	
Eritrea	*diversicollis* (Pic, 1922); *tenebrosus* (Weise, 1910).
Abyssinia	*tenebrosus* (Weise) (B.M.).
Egypt	*cordicollis* (Guerin, 1842); ? *subseriatus* (Reitter, 1887); ? *subseriatus* var. *unicolor* (Reitter, 1887).
Central Sahara, Libya, Tunisia, Algeria, Morocco	*cordatus*; *cordicollis* ab. *brovedanii* (Schatzmayr, 1939); *festae* (Dodero, 1924); *minutus* (Pic, 1903); *minutus* var. *kochi* (Schatzmayr, 1939); *volkonskyi* (Peyerimhoff, 1943).
Rio de Oro	*berlandi* (Peyerimhoff, 1942).
Canary Islands	*deserticola* (Wollaston, 1864).

It will be observed that the genus spreads from Portugal and the Canary Island in the west to Mongolia and North India in the east and that it also extends in the south to Yemen and Aden in Arabia and to certain parts of tropical Africa, namely, Eritrea and Abyssinia. It is interesting to note that this distribution, with a few exceptions, is confined to areas with not more than 10 inches of annual rainfall.

5. HABITS AND HABITAT.

Very little is known of the habits of the various species. That they are carnivorous and incapable of flight is suggested by the structure of their mandibles and the absence of the membranous wings. Certain species (*T. tenebrosus* (Weise) and *T. yemenensis* sp. n.) collected by Dr. Hugh Scott, F.R.S., and Mr. E. B. Britton from Yemen emit a reddish fluid from their leg and other joints. A similar fluid, assumed to be repugnatorial and protective in nature, is emitted by a large number of other Coccinellids and certain other Coleoptera, but its colour is usually amber or yellow. In some of the mounted specimens from Yemen, the red fluid has dried up in the form of globules at the femorotibial joints. The habitat in which the beetles are found varies considerably,

as will be seen from the following brief account, which brings together all the published information and also includes additional data on the labels. For the sake of convenience the habitat is divided into seven main categories and the relevant published remarks of additional interest are also given for some species.

Habitat of the Species of Tetrabrachys.

1. Under stones and in soil :
   cordatus (Rosenhaur, 1856 : 213), Spain—"several examples under stones in Granada, in June."
   cruciatus (Sahlberg, 1913 : 85), Syria—" in soil."
   deserticola (Wollaston, 1864 : 431), Canary Islands—" under stone, in dry region at Corralego, end of March, 1859."
   grandis (Pic, 1901 : 86), Anatolia.
   insculptus (Sahlberg, 1913 : 82), Palestine.
   krasnowi (Semenov, 1891 : 381), East Turkestan—" from rose-rockery."
2. Under stone, near water-hole :
   tenebrosus (Weise) Yemen, Haz—near San'a, *circa* 9200 ft., 4.ii.1938 (*H. Scott* and *E. B. Britton*) (B.M.).
3. Under dried moss :
   osculati (Marietti, 1844 : 72), European Turkey—" under dried moss in grave-yard."
4. From scrub :
   tenebrosus (Weise), Abyssinia ; Wachacha Ravine near Addis Abeba, *circa* 8000 ft., 9.ix.1926—from native scrub (*H. Scott*) (B.M.).
5. Under bark of tree :
   robusta sp. n., North India, Fatehpur R., Ramnagar, U.P.—under bark of *Shorea robusta*, 10.ii.1925 (*J. C. M. Gardner*) (B.M.).
6. On roots of plant :
   jacobsoni (Barovsky, 1909 : 96), Turkestan—" On roots of strongly aromatic worm-wood (ARTEMISIAE) in the desert of Golodnaya steppe, 9.v.1903.
7. In valleys and mountain slopes:
   bipustulatus (Barovsky, 1909 : 258), Turkestan.
   gibbosus (Sahlberg, 1913 : 87), Asia Minor—" in the deep valley of Bulghar Dagh, 27th April."
   haemorrhous (Solsky, 1882 : 83), Turkestan.
   sumakovi (Barovsky, 1909 : 260), Turkestan.
   tenebrosus (Weise), Yemen, Ghaiman, 9 miles S.E. of San'a, slopes of Jebel Girwan, *circa* 9000 ft. ; in valley, near stream, *circa* 8400 ft., 17–18.ii.1938 (*H. Scott* and *E. B. Britton*) (B.M.).
   yemenensis sp. n., Yemen, Ghaiman, slopes of Jebel Girwan, *circa* 9000 ft., 17.ii.1938 (*H. Scott* and *E. B. Britton*) (B.M.).

It may be pointed out here that for about two-thirds of the known species no information on their habitat is available. It is therefore not possible to draw any general conclusions from the above list. With some notable exceptions, such as the collections made by Dr. Hugh Scott and Mr. Britton, even the known information is not very extensive. However, it is clear that the beetles are found in obscure places, such as those mentioned above, where they must be looked for by interested observers.

6. Relationship with other Coccinellidae

The subfamily Tetrabrachinae is more related to the subfamily Coccinellinae than to Epilachninae, as is evident from the structure of the mouth-parts. Of the Coccinellinae, the tribe to which it is most closely related is the Coccidulini, within which it is allied to the genus *Coccidula* Kugel. in particular. In both the Tetrabrachinae and the Coccidulini the species are usually oblong-oval, moderately convex and pubescent throughout. The eyes are sub-entire and coarsely facetted, the clypeus is truncate, the antennae are long and clubbed, the maxillary palpi securiform, the first pair of coxal cavities open posteriorly, the prosternal process is flat and carinate, the femoral lines are usually complete and shorter than the first abdominal segment, the legs have elongate femora and slender, evenly arcuate and feebly bifid tarsal claws. They differ principally in the structure of their tarsi, which are clearly four-segmented and subtubular in Tetrabrachinae and apparently three-segmented with the first two segments flattened apically in Coccidulini. Further, in the former the antennae are ten-segmented and compact, including the obconical club, while in the latter they are eleven-segmented and loosely connected, including the club which appears serrate. There are five visible abdominal segments in Tetrabrachinae and six in Coccidulini. Certain species of the two groups agree in their habits in so far as they live in obscure places, such as roots of plants and in moss, but while the former are found mostly in a dry habitat, the latter are met with in marshy places, both inland and on the coast.

7. Description of New Species

Tetrabrachys robusta sp. n. (figs. 1, 17, 22, 25).

Oblong-oval, moderately convex; pubescence yellowish grey; head (except the black eyes) pronotum (except the fuscopiceous disc), scutellum, the narrower basal and the slightly wider lateral borders of elytra reddish brown. The remaining part of the latter piceous black except the narrow fusco-rufous or liver brown sutural border from the scutellum to the middle of elytra. Central part of the underside fuscous, the rest as well as the legs reddish brown.

Head subrounded in outline, the front nearly flat, punctation fairly fine and close; pubescence yellowish grey, thin, long and rather sparse; eyes coarsely facetted and rounded; clypeus broadly truncate anteriorly; antennae ten-segmented, compact, with obconical subdepressed club, first segment rounded oval and with long sensory hairs, the second narrower and slightly longer than wide, the third narrower and nearly twice as long as wide, the next three narrow, short and subequal and the last four segments forming the club, widening from base to apex except the last which is conical; labrum transverse, nearly three times as wide as long. *Pronotum* a little less than twice as wide as long, widely emarginate anteriorly, anterior angles rounded, lateral margin evenly rounded from the base to the apex and with the margins thickened and coarsely punctate, base weakly sinuate on either side before the posterior angles; disc moderately convex, and sloping evenly laterally and towards the base; punctation fairly close, finer on the disc and coarser laterally; pubescence as on the head, but slightly longer. *Scutellum* very small, triangular, with a few minute punctures and small hairs; base longer than the sides. *Elytra* oblong oval, width equal to four-fifths the length, moderately convex, shoulders widely rounded, obtuse posteriorly, subparallel in the middle and rounded towards the apex, lateral border with a narrow channel commencing from the shoulder and extending as far back as three-quarters its length; punctation with fine and coarse punctures intermixed, fairly dense and impressed, the former more numerous towards the apex and the latter more so towards the base and the lateral margin; pubescence as on pronotum, but denser. *Underside* with the punctation fine and fairly close; pubescence short and subdepressed; femoral lines (fig. 22) V-shaped but broken in the middle and with the outer arm slightly curved inwards near the base; spermatheca (fig. 17) semicircular and the last segments of abdomen (fig. 25) forming a tubular ovipositor with the ninth sternites filiform and beset with long delicate and sparse setae; its tenth tergite truncate apically.

Length 5·0 mm., *width* 3·0 mm.

Type: In the British Museum; NORTH INDIA, Fatehpur, Ram Nagar, U.P.; under bark of *Shorea robusta*, 10.iv.1925 (*J. C. M. Gardner*).

Paratypes: Two, in the British Museum; INDIA, Dehra Dun, U.P., 21.xi.1910; North-West Frontier Province.

Remarks.—In the regularly rounded lateral margins of the pronotum and the rounded shoulders, *T. robusta* resembles *T. weisei* (Reitter), but it is nearly twice the size of the latter. They also differ in coloration, punctation and pubescence (see p. 332).

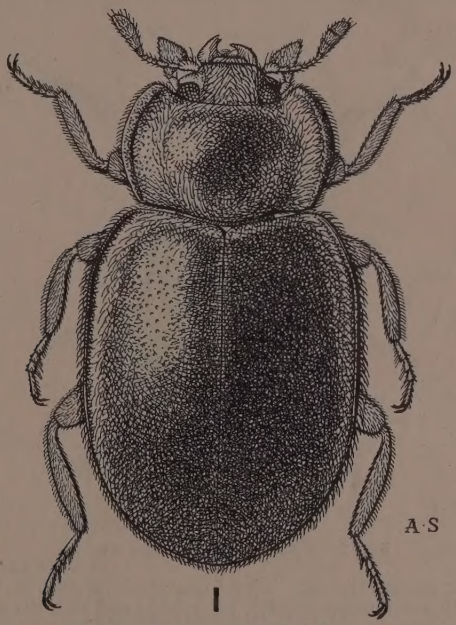

FIG. 1.—*Tetrabrachys robusta* sp. n.

Tetrabrachys gandhara sp. n. (figs. 2, 24, 29, 34).

Oblong, moderately convex, pubescence yellowish, head fusco-piceous except the black eyes and the reddish brown clypeus, antennae and mouth-parts; pronotum reddish brown; scutellum and elytra piceous black except about the apical one-fourth of the latter which is reddish brown. Except the dark brown median part of thorax and basal segments of abdomen, underside and legs reddish brown.

Head subrounded, the front slightly convex, punctation fine, impressed and moderately close; pubescence yellowish, moderately long and sparse; eyes coarsely facetted and with short delicate hair; clypeus truncate anteriorly and obliquely rounded laterally; antennae ten-segmented with compact, obconical, subdepressed club, the last segment of the latter subconical; labrum transverse, nearly twice as wide as long and with long and stout hair dorsally. *Pronotum* nearly two-thirds as long as wide, slightly emarginate anteriorly; anterior angles rounded; laterally the anterior one-third slightly rounded and narrower than the middle, the posterior one-third rather straight, a little narrower than the middle and with the posterior angles well defined and slightly obtuse; lateral margins thickened, indistinctly bordered and coarsely punctate; base weakly sinuate on either side before the posterior angles; disc convex gradually sloping on either side and shallowly depressed before the lateral border; punctation fine, impressed and moderately close; pubescence yellowish, moderately long and sparse. *Scutellum* triangular, base hardly

longer than the side, with a few minute punctures and short hairs. *Elytra* oblong, hardly two-thirds as wide as long, moderately convex, sharply curving towards the apical and the lateral margins, but less so towards the basal; shoulders with prominently thickened angles which extend on either side a little beyond the base of pronotum; posterior to the shoulders the lateral margins widen out slightly and run subparallel to each other for the greater part of the middle, after which they gradually curve towards the apex, which is rounded; the lateral margins are narrowly channelled or rebordered from the shoulder to nearly two-thirds their length; punctation consisting of both fine and coarse punctures, fairly close, well impressed, inter-mixed and subequal in numbers except that towards the apex the coarser punctures gradually disappear; pubescence as on pronotum, but the hairs are slightly coarser and rather subdepressed. *Underside* with moderately fine and close punctation and short and subdepressed pubescence; femoral lines V-shaped with the outer arms curved externally

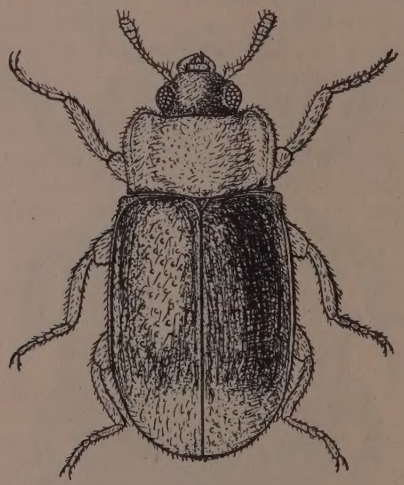

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FIG. 2.—*Tetrabrachys gandhara* sp. n.

and the inner almost straight (fig. 24). Of the male genitalia (figs. 29, 34), siphonal capsule triangular proximally and elongate distally, penis triangular with the sides twice as long as the base, paramera elongate with the apex rounded, filiform in side view and with a row of long sensory hairs along the margin from the middle to the apex.

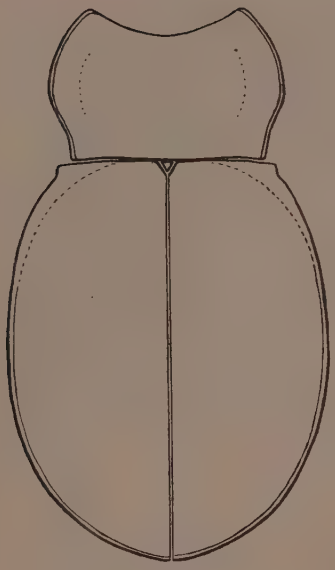
Length 3·6 mm., *width* 1·75 mm.

Type: A male, in the British Museum; NORTH INDIA, North-West Frontier Province (*Andrewes*).

Tetrabrachys cryptophagoides sp. n. (figs. 6, 19).

Body small, oblong, moderately convex, with the elytra near the suture less convex, upper surface shining, pubescence yellowish or grey. Head (except the black eyes and the pale brown antennae and labrum) and pronotum testaceous, elytra piceous, except the testaceous extreme apex and a very narrow, brown streak running along the lateral margin from the shoulder to the apex. The underside and the legs testaceous except for the dark brown metasternum and the middle of the first three abdominal sternites.

FIGS. 3–10.—(3) Outline of pronotum and elytra of *T. ovipennis* (Crotch); (4) outline of pronotum and base of elytra of *T. connatus* (Panzer); (5) the same of *T. marginatus* (Reitter); (6) outline of pronotum and elytra of *T. cryptophagoides* sp. n.; (7) outline of pronotum and base of elytra of *T. arabicus* sp. n.; (8) the same of *T. nigripennis* (Reitter); (9) ventral view of an elytron of *T. nigripennis* showing the shape of epipleuron; (10) the scale applicable to figs. 3 to 9 and 21 to 24.



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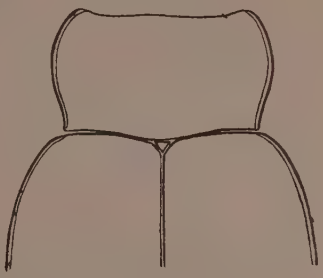

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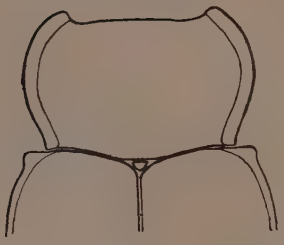

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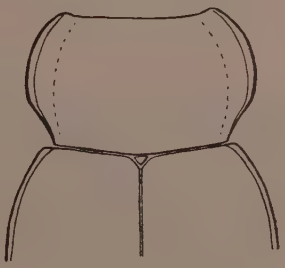

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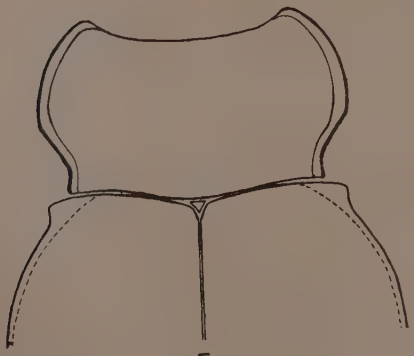

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Head subrounded, the front slightly convex; punctation fine, impressed and moderately close; pubescence yellowish, fine, rather short and sparse, except on the anterior margin of clypeus and on the labrum where the hairs are stouter; antennae ten-segmented with compact obconical, subdepressed club, the last segment of which is subrounded (base excepted) and bigger than the preceding. *Pronotum* (fig. 6) a little wider than long, subcordate, distinctly narrowing in the posterior one-third of the length; anterior margin fairly deeply emarginate, truncate in the middle and oblique on either side with the anterior angles well marked, narrower but rounded at the apex; lateral borders slightly thickened and narrowly margined, expanded and shallowly concave on either side of the moderately convex disc; base sinuate on either side before the posterior angles which are obtuse; punctation impressed, moderately close, fine on the disc and coarse on the sides; pubescence rather short and sparse, greyish and stouter on the disc and light yellow and finer on the sides. *Elytra* oblong, nearly two-thirds as wide as long, moderately convex, less so in the median part along the suture; base slightly wider than the base of pronotum, shoulder angles widely rounded and obtuse posteriorly; the lateral margins subparallel in the middle, regularly curved in the posterior one-third to form a rounded apex and narrowly rebordered from the shoulder to nearly two-thirds their length; punctation close, fairly impressed, coarser punctures numerous and arranged in irregular, longitudinal rows in the basal two-thirds, both coarse and fine punctures ill-defined and less impressed towards the apex, which is not wrinkled; pubescence greyish, moderately long, stouter and fairly dense. *Underside* finely and closely punctate and with short subdepressed pubescence; femoral lines forming a V, with the arms straight, subequal and pointed at the apex. Spermatheca (fig. 19) semicircular, evenly thick, and with wide striae.

Length 2·5 mm., *width* 1·25 mm.

Type: A female, in the British Museum; TURKESTAN, East Bokhara, 1898 (*Nufswald F. Hauser*).

Paratypes: Two, in the British Museum, with the same data as the type.

Remarks.—On account of its smaller size, strongly cordate pronotum and subrounded shoulder angles this species resemble *T. jacobsoni*, *minimus*, *pellucidus* and *haemorrhous*, all from Persia and Turkestan. The first three species are easily separated from it by their nearly unicolorous elytra, which are either brown or reddish testaceous and the last by the elytra being oval, black in the basal half and with the coarse punctures not arranged in longitudinal rows.

The three examples described are from Dr. Hauser's collection in the British Museum and bear the manuscript name (apparently in Heyden's handwriting) "*Lithophilus cryptophagoides* Reitter," but no published description or record under that name could be traced. The manuscript name has, however, been retained in describing the species.

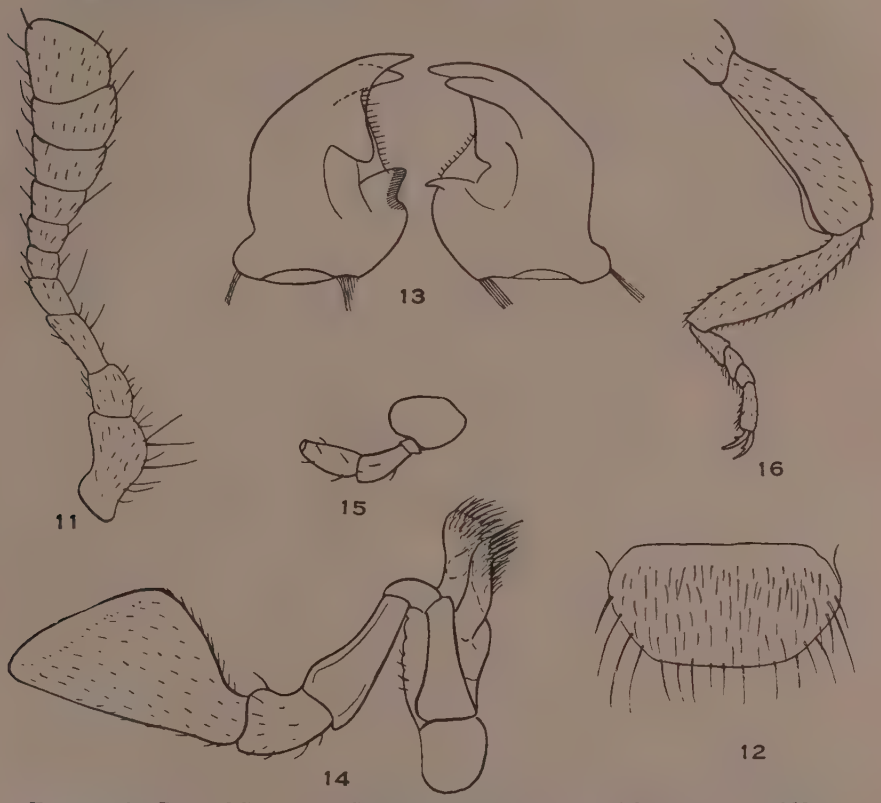
Tetrabrachys yemenensis sp. n.

Body small, oblong; elytra obovate, moderately convex laterally, rather subdepressed dorsally along the mid-longitudinal line; upper surface moderately shining, pubescence yellowish white. Head (except for the black eyes and the brown antennae and mouth-parts), pronotum, elytra, underside (except the light brown elytral epipleurae) and legs (except the light brown tarsi) dark brown.

Head subrounded, front slightly convex, punctation fine, impressed and moderately close, pubescence yellowish, thin, rather sparse and moderately long except on anterior margin of clypeus and dorsal surface of labrum, where it is stouter and slightly longer; clypeus broadly truncate anteriorly, emarginate laterally exposing the base of antennae; antennae ten-segmented, with a compact, narrowly obconical, subdepressed club, the last segment of which is oblong, narrower and longer than the preceding segment; labrum transverse, more than twice as wide as long, narrower anteriorly and subrounded laterally. *Pronotum* transverse, nearly two-thirds as long as wide, moderately convex, evenly sloping laterally and without a clearly demarcated disc; the anterior margin a little wider than the basal, weakly emarginate, with slightly protracted but evenly rounded anterior angles; the lateral margins rounded, narrower towards the base than towards anterior margin; base sinuate on either side before the posterior angles; punctation and pubescence similar to that on the head. *Scutellum* very small, triangular, with the base broader than the sides and with a few minute punctures and short hairs. *Elytra* obovate, straight at the base as far as the base of pronotum, broadly

expanded and rounded at the shoulders and gradually narrowed towards the rounded apex; the shoulders and the basal half of the lateral margins of elytra narrowly rebordered; punctation fine, moderately impressed and fairly close, coarse punctures absent; apex with faint transverse creases; pubescence yellowish white, thin, moderately long, rather sparse and subdepressed. *Underside* with the elytral epipleura hardly extending beyond the first abdominal segment, punctation fine and sparse, pubescence short and subdepressed, femoral line V-shaped with the arms slightly curved externally.

Length 2·6 mm., *width* 1·3 mm.



FIGS. 11–16.—Parts of *T. connatus* (Panzer); (11) antenna; (12) labrum; (13) mandibles; (14) maxilla; (15) side view of labium and labial palpus; (16) leg.

Type: A female, in the British Museum; ARABIA, Yemen, Ghaiman, about 9 miles S.E. San'a, slopes of Jebel Girwan, 9000 ft. altitude, 17.ii.1938 (*H. Scott* and *E. B. Britton*).

Remarks.—This species is distinguished from others by the distinctly obovate shape of the elytra, the rather subdepressed body, the uniformly dark brown coloration of the upper surface, the absence of coarser punctures and the moderately long, thin and rather sparse pubescence.

Tetrabrachys arabicus sp. n. (figs. 7, 18).

Body oblong ovate, rather subdepressed, more so towards the apex, upper surface moderately shining, pubescence yellowish. Head (except the pale brown to grey eyes and brownish antennae, maxillae and labium), pronotum, underside and legs reddish brown, elytra variable

in colour, uniformly piceous black in the type, and entirely reddish brown, or piceous black with the apex reddish brown or reddish brown with piceous suture in some paratypes.

Head subrounded, slightly convex in front; punctation fine, impressed and fairly close; pubescence yellowish, thin, long and sparse; clypeus obliquely emarginate laterally and broadly truncate anteriorly; labrum twice as wide as long, narrowed anteriorly, subrounded laterally; antennae ten-segmented, club 3-segmented, subcompressed and broadly obconical, with the last segment subrounded, broader than long and subequal to the preceding segment. *Pronotum* (fig. 7) a little less than two-thirds as long as wide, moderately convex in the middle, gradually sloping on either side to the lateral margins; weakly emarginate anteriorly, anterior angles broadly rounded; lateral margins rounded in the anterior two-thirds of their length and slightly narrowing in the posterior one-third, very narrowly margined; posterior angles weakly pointed, the basal margin slightly sinuate on either side before the angles. Punctation moderately coarse, nearly uniform, well impressed and fairly close; pubescence yellowish, fairly long, thinner on the disc, dense laterally. *Scutellum* very small, subtriangular with the apex rounded, and with a few impressed punctures and short hairs. *Elytra* ovate, width nearly equal to three-quarters of the length, subdepressed in the dorsal median part and towards the apex, but moderately convex towards the sides in the basal half; straight at the base as far as the base of pronotum, shoulder angles (fig. 7) rounded, obtuse and broad posteriorly; lateral margins subparallel before the middle and rounded towards the apex; from the shoulders to the middle of their length the margins very narrowly rebordered; punctation well impressed and fairly close, consisting of coarser punctures which are intermixed with the finer ones, the former tending to disappear towards the apex; pubescence light yellowish, fairly stout, rather subdepressed, moderately long and dense. *Underside* moderately closely punctured and with fairly long, yellowish subdepressed pubescence; femoral lines broadly V-shaped with subrounded angle. Spermathecal capsule (fig. 18) semicircular, broader and bluntly rounded distally, narrow and long proximally.

Length 3·3 mm., *width* 2·0 mm.

Type: A female, in the British Museum; Arabia, El Hajaz, 1915 (*Millingen*).

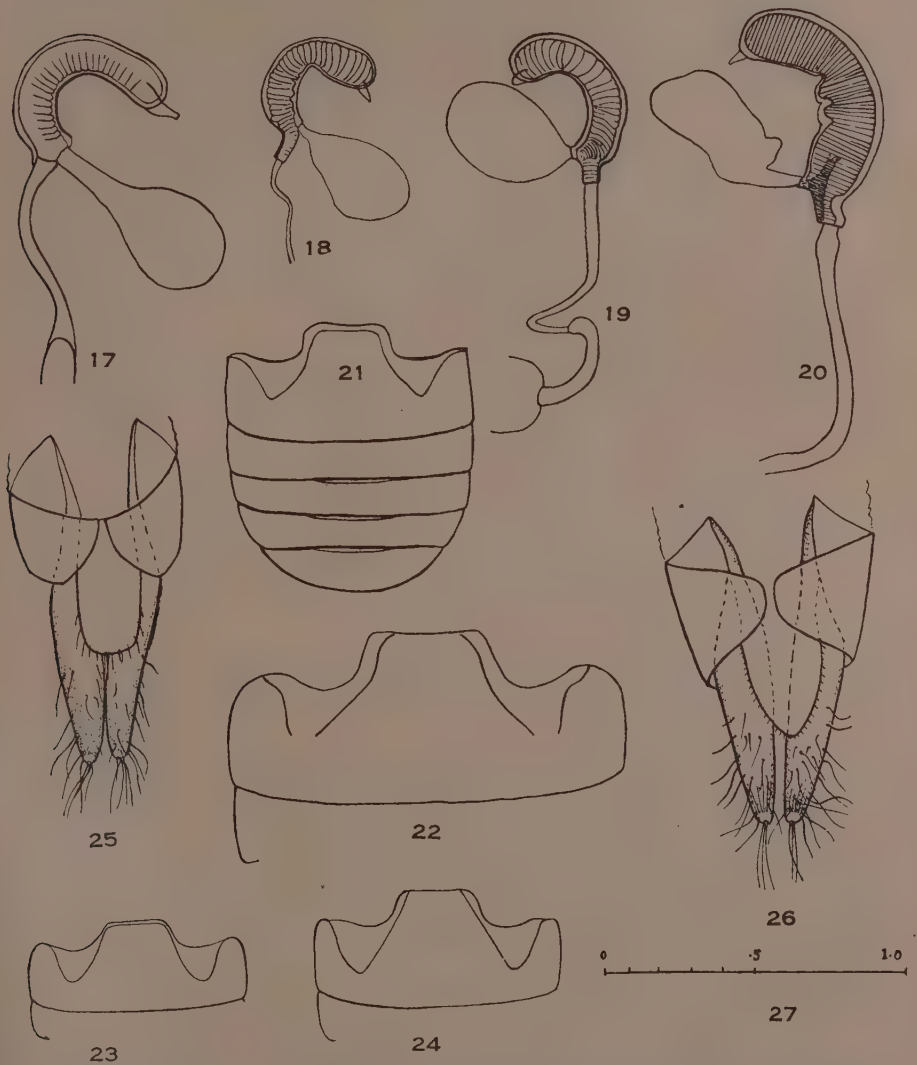
Paratypes: Five, in the British Museum, with the same data as the type.

Remarks.—This species is allied to *T. tenebrosus* (Weise) (from Arabia, Eritrea and Abyssinia) in the shape of the pronotum, and shoulder angles, but but it is smaller and relatively broader; with well-impressed coarser punctures on elytra intermixed with finer ones, and with the reddish brown head and pronotum which are usually piceous in *tenebrosus*. *T. diversicollis* (Pic) from Eritrea is as variable in coloration as *arabicus*, but is easily separated by its smaller size, the elongate oblong shape of the body, the greater convexity and by the pronotum, which is not narrowed posteriorly.

8. Key to the Species.

In preparing the following key it has been found that the species may be conveniently divided into two main groups on the form of their shoulder-angles, which are either pointed or rounded to subrounded. After this, the outline of the pronotum and of the elytra, the size of the body and the characters of the punctation, pubescence and coloration have been employed in that order as far as possible. It will be observed that by this arrangement the species placed near one another in the key are also very often related in their geographical distribution (i.e. they are reported from the same or neighbouring countries). In some species, of which long series have been examined, the coloration varies considerably and attention has been drawn to it in the key. *T. atlanticus* (Escalera, 1914) from Spain is here believed to be a synonym of *T. deserticola* (Wollaston, 1864) from the Canaries, as the type of the latter (in the British Museum) agrees with Escalera's description of *atlanticus* except in being 0·5 mm. longer. In the larger species, measuring 4·0 to 4·5 mm. in length, this difference is not significant. Escalera attributes woolly pubescence to *deserticola*, though this character is neither given in the original description nor present in the type. In both of them the pubescence is golden yellow, short

and subdepressed. Another species, *T. osculati* (Marietti, 1844) from European Turkey, has been omitted from the key because the original description is inadequate. Species of which examples have been seen by the author are indicated by an asterisk.

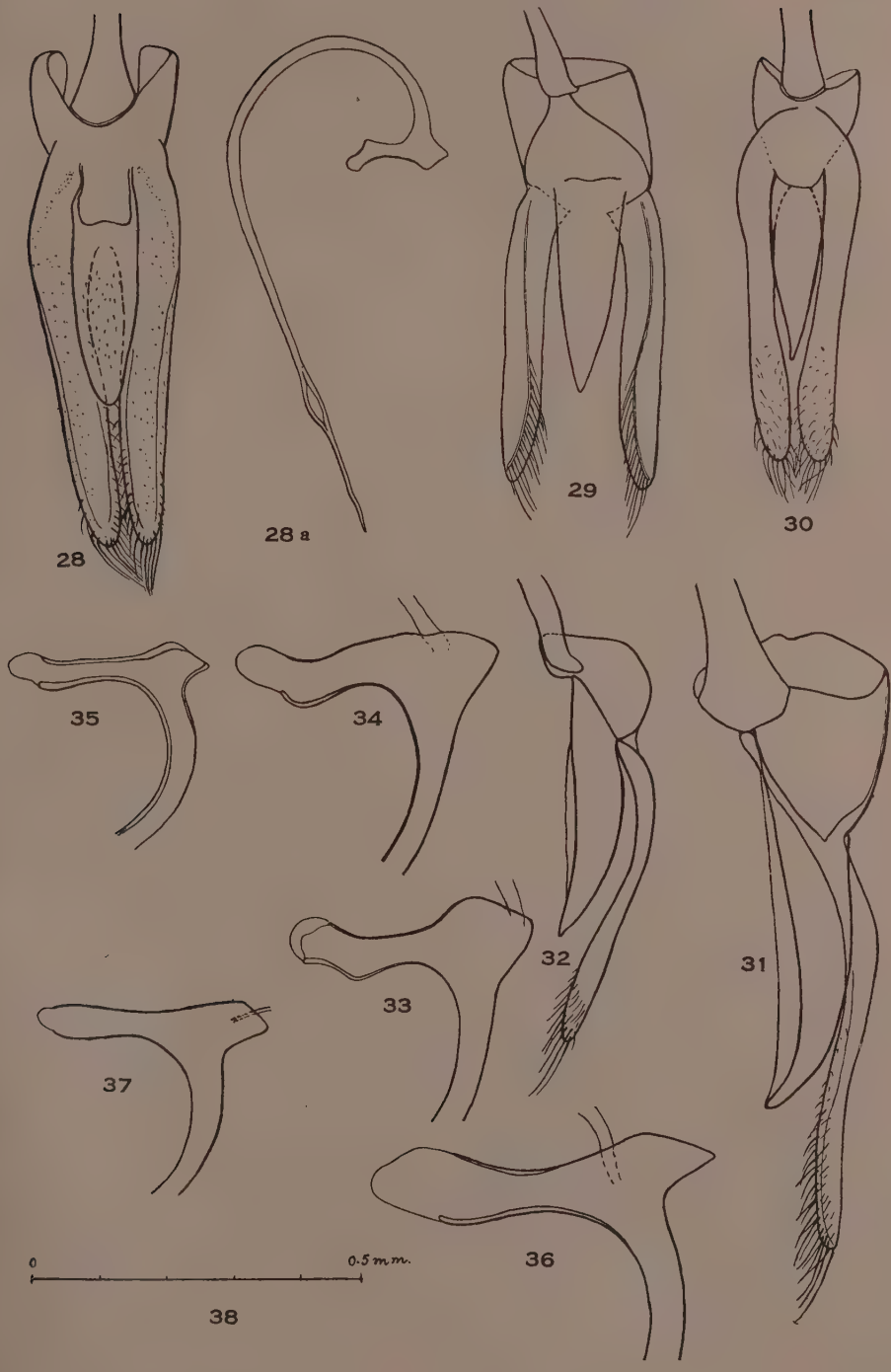


Figs. 17–21.—Spermathecae of (17) *T. robusta* sp. n.; (18) *T. arabicus* sp. n.; (19) *T. cryptophagoides* sp. n.; (20) *T. marginatus* (Reitter); (21) abdominal sternites of *T. connatus* (Panzer). Figs. 22–24.—The first abdominal sternite showing the femoral lines in: (22) *T. robusta*; (23) *T. nigripennis* (Reitter); (24) *T. gandhara* sp. n.; Figs. 25–26.—The last abdominal segments of ♀ in: (25) *T. robusta*; (26) *T. marginatus*. Fig. 27.—1·0 mm. scale applicable to figs. 25, 26 and 28*a*.

Key to the Species of *Tetrabrachys*.

1. Elytra with the shoulder-angles rounded or subrounded (figs. 1, 6–8) . . . . . 2.
   Elytra with the shoulder-angles pointed (figs. 2–5) . . . 25.
2 (1). Pronotum not cordiform, as broad at base as at apex; lateral margins regularly rounded, thickened and coarsely punctate (fig. 1) . . . . . 3.
   Pronotum more or less cordiform, narrower at base than at apex; lateral margins moderately rounded to sub-angular (figs. 6–8) . 4.
3 (2). Body small, 3·8 mm. long; head and elytra (except the apex) pitchy black, the remaining part of the body rusty red; fine and coarse punctures on elytra intermixed; pubescence yellowish grey, short and sparse (Loc. Caucasus) . . *weisei* (Reitter).
   Body large, 5·0 mm. long; head, pronotum (except the fusco-piceous disc), scutellum, and basal and external borders of elytra reddish brown, remaining part of elytra piceous black, fine and coarse punctures on elytra close, intermixed and well impressed; pubescence yellowish grey, thin, long and dense (Loc. North India; fig. 1) . . . . . **robusta** sp. n.
4 (2). Pronotum with the lateral margins subrounded, slightly narrowing towards the base, body 3·3–5·6 mm. long . . . . 5.
   Pronotum with the lateral margins subangular near the middle and sinuate towards the base; body 2·0–4·0 mm. long . . . 15.
5 (4). Coarse punctures on elytra arranged in longitudinal rows . . 6.
   Coarse punctures on elytra not in longitudinal rows, irregularly intermixed with finer ones . . . . . 8.
6 (5). Body elongate oval, not longer than 3·5 mm.; uniformly pale red; punctation sparse; pubescence partly yellowish, long and semi-erect (Loc. Rio de Oro, West Africa) . *berlandi* (Peyerimhoff).
   Body oblong-oval, more than 4·0 mm. long; not uniformly coloured . . . . . .
7 (6). Pronotum with a sub-linear black spot near base; elytral punctures nearly obsolete and confluent, pubescence on the head reddish and dense, but sparse on the pronotum and elytra (Loc. N. China) . . . . . *villosa* (Faldermann)*.
   Pronotum entirely rusty red; elytral punctures well impressed, and not confluent; pubescence golden yellow, short and sub-depressed (Loc. Canary Islands and Spain) *deserticola* (Wollaston)*.
8 (5). Pronotum with the lateral margins reflexed, disc more convex . . 9.
   Pronotum with the lateral margins not reflexed, disc less convex and evenly sloping on either side to the lateral margin (fig. 7) . 10.
9 (8). Body oblong-oval, 5·6 mm. long; pronotum wide and expanded laterally, body only slightly shining, rusty red, with a large, black, spot on the elytra common to both; pubescence greyish (Loc. East Turkestan) . . . . *krasnowi* (Semenov).
   Body elongate-oval, 4·0 mm. long; pronotum narrower; body shining, russet brown with the elytra piceous excepting the narrow margins; pubescence yellowish (Loc. Sinai) *peyerimhoffi* (Pic).

Figs. 28–30.—Front view of the male genitalia of: (28) *T. connatus* (Panzer), (29) *T. gandhara* sp. n., (30) *T. minutus* (Pic). Figs. 31–32.—Side view of the male genitalia of: (31) *T. tenebrosus* (Weise), (32) *T. nigripennis* (Reitter). Fig. 28*a*.—Sipho of *T. connatus*. Fig. 33.—Enlarged siphonal capsule of the same. Figs. 34–37.—Enlarged siphonal capsule of: (34) *T. gandhara*, (35) *T. minutus*, (36) *T. tenebrosus*, (37) *T. nigripennis*. Fig. 38.—Scale applicable to figs. 11–20 and 28–37.


28
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38

10 (8). Body small, 2·6 mm. long; uniformly brown; elytra obovate, widest across the shoulders; coarse punctures absent (Loc. Yemen) . . . . . **yemenensis** sp. n.

Body larger, from 3·2 to 5·6 mm. long; not always uniformly coloured, elytra not widest across the shoulders; coarse punctures present on elytra . . . . . 11.

11 (10). Head and pronotum usually rusty red and lighter than elytra, which are mainly piceous; body length 3·2–3·4 mm. . . 12.

Pronotum and elytra of the same colour, usually piceous or brown; body length 4·0–5·6 mm. . . . . 13.

12 (11). Body elongate oval and fairly convex; disc of pronotum more finely punctate than the sides; elytra black with the apical one-quarter obscurely rusty; pubescence greyish, long and dense (Loc. Crimea) . . . . . *tauricus* (Semenov).

Body broadly oblong-oval, rather subdepressed, pronotum uniformly and fairly coarsely punctate; elytra usually uniformly piceous, sometimes lighter or with rusty red apex; pubescence yellowish, long and fairly dense . . . . **arabicus** sp. n.

13 (11). Pronotum and elytra usually piceous to dark brown, the latter broadest a little behind the middle and obtusely rounded towards the apex, with faint longitudinal striae, pubescence yellowish grey and dense, finer punctures close, coarser punctures fewer and slightly more distinct (Loc. Eritrea, Yemen, etc.) *tenebrosus* (Weise)*.

Pronotum and elytra reddish testaceous, the latter not broadest behind the middle and without the faint longitudinal lines; pubescence greyish . . . . . 14.

14 (13). Body robust, broadly oblong, elytral punctures close and impressed; pubescence sparse (Loc. Palestine) . . . *grandis* (Pic).

Body less robust and less broad; elytral punctures close but shallow; pubescence dense (Loc. Eastern Persia) *zarudnyi* (Barovsky).

15 (4). Elytra with uniform, fine punctures, coarser punctures absent; body strongly oval and convex, yellowish rusty red (Loc. Turkestan) . . . . . *semenovi* (Barovsky).

Elytra with fine and coarse punctures . . . . . 16.

16 (15). Coarser punctures on elytra arranged in longitudinal rows . . 17.

Coarser punctures on elytra not in rows, intermixed irregularly with the finer ones . . . . . 21.

17 (16). Head, pronotum and elytra of the same colour, pubescence short. 18.

Elytra, in parts, piceous and darker than the head and pronotum, pubescence long . . . . . 19.

18 (17). Body uniformly brown, rather elongate, with the middle of the lateral margins of elytra subparallel, not transparent; elytra closely punctate but not wrinkled at the apex (Loc. Turkestan) *jacobsoni* (Barovsky).

Body reddish testaceous, oblong-oval, with the lateral margins of elytra broadly rounded; transparent, elytra closely punctate and wrinkled at the apex (Loc. Persia) . . *pallucidus* (Barovsky)

19 (18). Body large, 3·3–3·5 mm. long, fairly broad, and convex; rusty brown except the black disc of elytra (Loc. Turkestan) *hissarensis* (Barovsky).

Body small, 2·0–2·5 mm. long, rather elongate and less convex, elytra not with the above coloration . . . . . 20.

20 (19). Body 2·0 mm. long, yellowish brown except the piceous apex of the elytra ; pubescence dense, long and golden (Loc. West Persia) *minimus* (Barovsky)*.

Body 2·5 mm. long, yellowish brown with the elytra piceous except at the narrow apical border, which is brown ; pubescence dense, long and greyish (Loc. Turkestan) . **cryptophagoides** sp. n.

21 (16). Head, pronotum and elytra uniformly reddish ; base of elytra narrow and with sharply rounded shoulder-angles (Loc. Turkestan) . . . . . *glazunovi* (Barovsky).

Elytra entirely or in part piceous and darker than the head and pronotum ; base of elytra fairly wide, shoulder-angles sharply or broadly rounded . . . . . 22.

22 (21). Body 3·3–4·0 mm. long, shoulder-angles sharply rounded . . 23.

Body 2·5 mm. long, shoulder-angles broadly rounded . . . 24.

23 (22). Elytra totally piceous or sometimes with brown apex, the latter not wrinkled ; coarse punctures fewer, pubescence short and yellowish (Loc. Turkestan ; figs. 8, 9, 23, 32 and 37) *nigripennis* (Reitter)*.

Elytron with a black, large, oblong, discal spot, and with the apex wrinkled ; coarse punctures more numerous, pubescence long and yellowish grey (Loc. Turkestan) . *bipustulatus* (Barovsky).

24 (22). Body more shining, and convex, elytra with the disc piceous and the lateral margins and the apex russety (Loc. Tunisia, Arabia ; figs. 30 and 35) . . . . . *minutus* (Pic)*.

Body less shining and less convex, elytra piceous from the base to a little beyond the middle (Loc. Turkestan) *haemorrhous* (Solskii)*.

25 (1). Pronotum not cordiform, hardly narrowed towards the base, not expanded laterally (fig. 2) . . . . . 26.

Pronotum cordiform, narrowed towards the base, not always expanded laterally (figs. 3–5) . . . . . 31.

26 (25). Body not more than 3·0 mm. long . . . . . 27.

Body more than 3·5 mm. long . . . . . 28.

27 (26). Coarse punctures on elytra absent, fine punctures uniform, body pale testaceous except the darker disc of elytra (Loc. Persia). *pallidus* (Crotch)*.

Coarse punctures on elytra present and irregularly intermixed with fine punctures, body reddish testaceous with the elytra varying in colour from black to reddish testaceous (Loc. Eritrea). *diversicollis* (Pic)*.

28 (26). Body 3·6–3·7 mm long ; coarse punctures absent or obsolete . 29.

Body 5·0–5·6 mm. long ; coarse punctures numerous and impressed . . . . . 30.

29 (28). Pronotum rusty red with the disc widely fuscous, thickened and distinctly margined laterally ; elytra piceous except at the shoulders and apex, coarse punctures more numerous laterally, underside black (Loc. Asia Minor). . *insculptus* (Sahlberg).

Pronotum entirely rusty-red, moderately thickened but not margined laterally, elytra piceous except the apical one-fourth ; coarse punctures not crowded laterally, sparse towards the apex ; underside mostly reddish (Loc. N. India) . . **gandhara** sp. n.

30 (28). Body elongate, elytra black except the brownish apex; punctation even, fine, coarse punctures absent (Loc. Caucasus) *caucasicus* (Weise).

Body oblong-oval, elytra piceous except the paler base; punctation mixed, coarser punctures obsolete (Loc. Asia Minor, Kurdistan) . . . . . *major* (Crotch)*.

31 (25) Pronotum not expanded laterally, moderately narrow towards the base (fig. 4); elytra oblong to elongate oval with the lateral margins usually subparallel . . . . . 32.

Pronotum expanded laterally, very narrow towards the base (fig. 3 & 5); elytra elliptical to oblong-oval with the lateral margins widely rounded (fig. 3) or sub-parallel in the middle. . . 40.

32 (31). Coarse punctures on elytra sparse and arranged in interrupted longitudinal rows . . . . . 33.

Coarse punctures on elytra not in longitudinal rows, dense and irregularly intermixed with finer punctures . . . . 34.

33 (32). Body 3·3 mm. long, elongate, convex; head pitch black, pronotum yellowish red, weakly emarginate anteriorly; elytra black with blue sheen and light yellowish border; underside piceous (Loc. Siberia) . . . . . *roddi* (Barovsky).

Body 3·8 mm. long, more elongate and depressed; head, pronotum and elytra (except a large common sutural black spot) rusty red; pronotum deeply emarginate anteriorly; underside rusty red (Loc. Syria) . . . . *cruciatus* (Sahlberg).

34 (32). Body elongate-oval, reddish testaceous; elytra with three black spots, one sutural and elongate-oblong, the other two smaller, each near the lateral margin (Loc. Syria) *trimaculatus* (Reitter).

Body elongate oval, sometimes slightly broader towards the apex; elytra without the three black spots as in the above species . 35.

35 (34). Body 3·0 mm. long, head and pronotum rusty red; elytra black except reddish border (Loc. Anatolia) . . *anatolicus* (Pic)*.

Body 3·5–4·0 mm. long, pronotum and usually the apex of elytra rusty red, rest of upper surface black . . . . . 36.

36 (35). Lateral margin of pronotum thick, rugose and coarsely punctate, broadest before the middle . . . . . 37.

Lateral margin of pronotum thick but smooth, less coarsely punctate and broadly submargined, broadest in the middle . . 38.

37 (36). Body oblong oval, rather broad, glossy; pubescence on pronotum short, sparse and black on the discal area; on the elytra short, denser and yellowish (Loc. Greece) . *kalawrytus* (Reitter)*.

Body elongate oval, much narrower, more glossy and with sparse, short, yellowish and subdepressed pubescence on the pronotum and elytra (Loc. Caucasus-Armenia) . . *araxia* (Reitter)*.

38 (36). Body 3·5 mm. long, upper surface glossy, head piceous, pronotum rusty red with short, sparse, greyish pubescence on the disc; elytra uniformly piceous or rarely reddish on the apex (Loc. Southern Europe) . . . . . *connatus* (Panzer)*.

Body 4·0 mm. long, upper surface subopaque, not glossy, head piceous or reddish; pubescence long, dense, even and yellowish grey; elytra black except the rusty red apex . . . 39.

39 (38). Body less robust, rather elongate ; head piceous, elytra subparallel from behind the shoulders to the middle and broader from the latter towards the apex ; coarse punctures as much impressed as the fine ones (Loc. Greece) . . *graecus* (Reitter)*

Body rather more robust and less elongate ; head reddish, elytra subparallel in the middle, not broad from the latter towards the apex, coarse punctures less impressed than finer ones (Loc. Crete) . . . . . *creticus* (Reitter)*.

40 (31). Elytra elliptical with the lateral margins widely rounded . . 41.

Elytra oblong-oval with the lateral margins subparallel in the middle . . . . . 43.

41 (40). Elytra gibbous at the base, less convex and narrower posteriorly ; pitchy black ; fine and coarse punctures intermixed, sparse ; pubescence short, yellowish and sparse (Loc. Asia Minor) *gibbosus* (Sahlberg).

Elytra more convex in the middle than towards the base and evenly sloping in all directions ; fine and coarse punctures intermixed and dense . . . . . 42.

42 (41). Body 3·2 mm. long ; elytra pitch-black except the large reddish humeral spot and sometimes a reddish narrow apical border (Loc. Palestine) . . . . . *ovipennis* (Crotch)*.

Body 4·0 mm. long ; elytra uniformly black (Loc. Rhodes Island) *silvestri* (Schatzmayr).

43 (40). Coarser elytral punctures arranged in longitudinal rows, rather shallow ; head reddish, elytra pitch black, except the paler lateral margins or the apex or both . . . . . 44.

Coarser elytral punctures not in longitudinal rows, irregularly intermixed with finer punctures ; head piceous or reddish, elytra pitch black except the paler or rusty red external border . . 46.

44 (43). Pronotum with the lateral margin broadly thickened and coarsely punctate ; elytra shining, pitch black except the narrow reddish external border ; pubescence long, dense and golden yellow (Loc. Mongolia) . . . . . *kozlovi* (Barovsky).

Pronotum with the lateral margins not broadly thickened or more coarsely punctate . . . . . 45.

45 (44). Head reddish but antennae and palpi black ; elytra black except the pale and narrow lateral margins, with traces of longitudinal striae situated near the suture and with more numerous punctures than the rest of the surface ; pubescence short, greyish (Loc. Cyreniaca) . . . . . *festae* (Dodero).

Head, antennae and palpi reddish ; elytra without the longitudinal striae, black except the pale apex ; pubescence long, dense, depressed, and yellowish grey (Loc. Siberia (?), Egypt) *subseriatus* (Reitter)*.

46 (43). Head piceous black except the reddish antennae and mouth ; body longer or shorter than 4·0 mm. . . . . 47.

Head, antennae and mouth reddish, body not less than 4·0 mm. 48.

47 (46). Body 3·7–4·5 mm. long, elytra black with narrow pale external margins (including apex) ; with obsoletely impressed longitudinal striae near the suture, densely punctate, coarser punctures impressed ; pubescence short, greyish (Loc. Egypt) *cordicollis* (Guérin)*.